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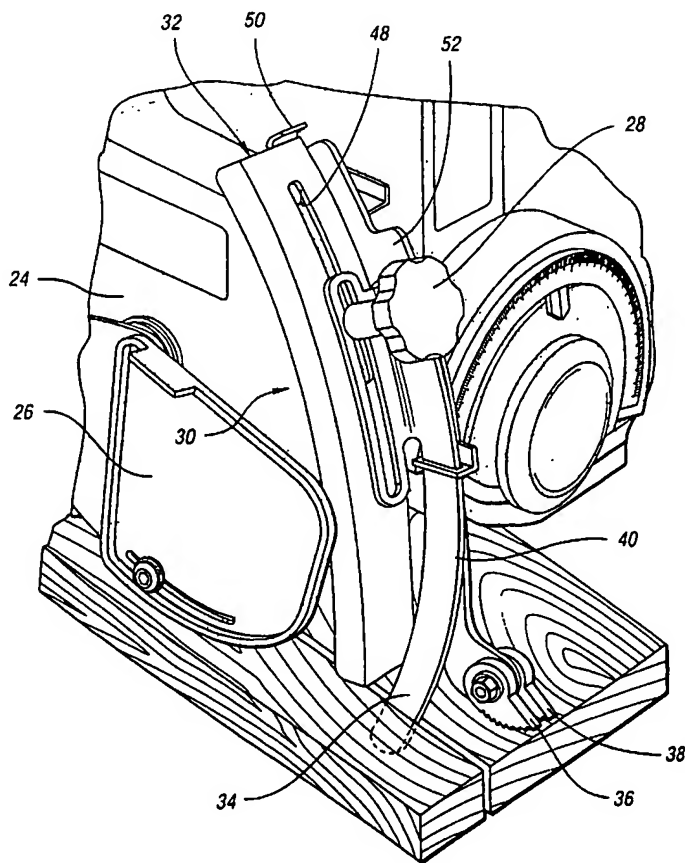
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[Continued on next page]

(54) Title: A RAPID SET GUARD SYSTEM FOR A RADIAL ARM SAW



(57) Abstract: A quick set guard system for a radial saw having an arcuately-shaped hand guard (32) attachable to outfeed end of the stationary upper protective shield (24) covering the saw blade (22). The hand guard (32) has a pawl arm (40) to which are mounted a pair of anti-kickback pawls (36, 38). The location of the anti-kickback pawls (36, 38) relative to the hand guard (32) is selected such when the hand guard (32) is positioned a selected distance from a workpiece, the location of the anti-kickback pawls (36, 38) are automatically set. The guard system also includes a riving knife (34) attachable to the hand guard (32). The hand guard (32) and riving knife (34) are independently adjustable relative to the upper surface of the workpiece.

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A RAPID SET GUARD SYSTEM FOR A RADIAL ARM SAW

TECHNICAL FIELD

5 The invention is related to radial arm saws and in particular to a guard system provided at the outfeed of the saw blade when the saw blade is in the rip saw position.

BACKGROUND ART

10 Typically, a radial arm saw consists of a circular saw mounted on a radial arm suspended above a work table. The radial arm is cantilevered from a column attached to the rear end of the work table. The radial arm saw may be operated in a cross-cut mode in which the circular saw is moved back and forth along the length of the radial arm and in a rip saw position in which the circular saw is rotated 90° from the cross-cut position. In the rip saw position, the circular saw is held stationary and the workpiece manually fed into the saw blade by an operator.

15 Because the saw may be operated in at least two different positions and modes of cutting, different problems can arise from improper use. In order to fully appreciate the problems involved in rip cutting, it is important to understand the nature of the rip-cutting operation. Rip cutting generally involves changing the width of an elongated workpiece. Normally, in a rip cutting operation, the cut is made parallel to the grain of the workpiece. The workpiece is fed into the motor driven saw blade parallel to a rip fence which is set at a desired distance from the saw blade. The rip fence serves as a guide for the workpiece as it is being cut.

20

The problems associated with the rip cutting operation include outfeed zone blade exposure, kickback and wrong way feeding. If the operator, contrary to the manufacturer's operating instructions, reaches behind the saw blade during rip

cutting, and tries to guide, hold or pull the workpiece through the rotating saw blade, the rotating saw blade can accidentally pull the workpiece and the operator's hand back into the saw blade. As a result, the touching or pulling of the workpiece at the outfeed end of the saw while the blade is still spinning can result in operator injury.

5 Kickback occurs when the saw blade is pinched or bound in the workpiece. This can result in the workpiece being propelled or kicked back towards the operator and may even result in the entire workpiece being thrown towards the operator if the operator is standing directly in line with the direction of feed. Wrong way feed occurs when the operator attempts to feed the workpiece into the saw from
10 the outfeed side of the saw blade, the rotation of the saw blade can rapidly pull the workpiece into the saw blade. As a result of this rapid pulling of the workpiece by the rotating saw blade, the operator can be pulled toward the rotating saw blade.

 Currently, the manufacturers of radial arm saws have developed blade guards to reduce injury to the operators resulting from misuse of the saw. Examples
15 of such hand guards are taught by Metzger Jr. in U.S. Patents 5,287,779; 5,287,780 and 5,353,670. The present invention is a rapid set guard system which is operative to protect the operator from his own carelessness, kickback, and attempting to feed the workpiece into the saw blade the wrong way.

20 SUMMARY OF THE INVENTION

 The invention is a rapid set guard system for a radial arm saw when used in a rip-cutting mode of operation. The guard system consists of a hand guard having an arcuate profile mating with the contour of the stationary upper protective shield covering the upper half of the motor driven saw blade. The hand guard has
25 a "U" shaped cross-section which straddles the upper protective shield along its length and prevents access of the operator's hands from engaging the rotating saw blade below the upper protective shield. The hand guard is mounted to the protective shield by means of a locking knob received through a longitudinal slot which permits

the hand guard to be moved up and down relative to the workpiece along the periphery of the upper protective shield. The hand guard further has a pawl arm to which is mounted a pair of kickback pawls. The kickback pawls are located by the pawl arm such that when the base of the hand guard is on or slightly above the upper surface of the workpiece to be cut, the position of the anti-kickback pawls is automatically and properly set. A riving knife may be attached to the hand guard by the same locking knob that locks the hand guard to the upper protective shield covering the top half of the saw blade. The locking knob is received through a slot provided in the riving knife and is independently adjustable relative to the workpiece.

10 One object of the invention is a guard system for a radial arm saw which is easy to set when the saw is configured for rip-cutting operation.

Another object of the invention is a guard system in which the anti-kickback pawls are automatically set with the setting of the guard system relative to the workpiece.

15 Still another object of the invention is a guard system that can be adapted to existing radial arm saws without modification.

Yet another object of the invention is the ability to set the riving knife independent of the anti-kickback pawls.

20 Still another object of the invention is that the anti-kickback pawls prevent the wrong way feeding of the workpiece into the saw blade.

Another object of the invention is a guard system placed at the outfeed end of the saw to having sufficient width to inhibit injury to the hand and fingers of the operator by the rotating saw blade improperly placed in the outfeed region.

25 These and other objects of the invention will become more apparent from a reading of the specification in conjunction with the appended drawings.

BRIEF DESCRIPTION OF DRAWINGS

FIGURE 1 is a perspective of a radial arm saw incorporating the quick set guard system.

FIGURE 2 is an exploded view of the guard system.

5 FIGURE 3 is a cross-section of the hand guard.

FIGURE 4 is a partial perspective showing the location of the hand guard and anti-kickback pawls when set relative to a workpiece.

BEST MODE FOR CARRYING OUT THE INVENTION

10 Figure 1 shows the details of a radial arm saw which incorporates the quick set guard system according to the invention. The radial saw comprises of a table 10 above which is suspended an electrically driven circular saw assembly 12. The saw assembly 12 is suspended from a radial arm 14 supported by a vertical column 16 generally located at the back of the table. The height of the saw assembly 12 above the table 10 is adjustable by means of a hand crank 18 in a conventional
15 manner.

 The saw assembly 12 is pivotably mounted to the radial arm 14 and can be rotated at least 90° from a cross-cut position to a rip-cut position. In the cross-cut position, the saw may be manually displaced along to the length of the radial arm 14. The saw assembly comprises an electric motor 20 which rotates a
20 circular saw blade 22. The upper portion of the saw blade 22 is covered by a stationary upper protective shield 24 which protects the operator from flying saw dust and debris and prevents the operator from accidentally contacting the upper half of the spinning saw blade.

The lower portion of the saw blade 22 is covered, at least on one side, by a lower protective shield 26 pivotably attached to upper protective shield 24. The lower protective shield 26 is displaced by engagement with the workpiece to be cut as it is fed into the saw.

5 Referring additionally to Figure 2, a hand guard system 30 according to the invention is attached to upper protective shield 24 adjacent to the outfeed end by means of a locking knob 28 threadably received in a threaded bore. In many radial arm saws currently on the market, the locking knob 28 is already in existence and is used to lock a riving knife to the upper protective shield. The hand guard
10 system 30 comprises a hand guard 32 and a riving knife 34 as is more clearly illustrated in Figure 2. A pair of anti-kickback pawls 36 and 38 are pivotably attached to a pawl arm 40 attached to or formed integrally with hand guard 32. The hand guard 32 has an arcuate profile which matches the radial contour of the upper protective shield 24 and has an elongated slot 42 through which is received the
15 locking knob 28. The riving knife 34 also has a mounting bracket 44 which has a corresponding elongated slot 46. The locking knob 28 also passes through the slot 46 and secures the riving knife 34 to the hand guard 32.

Referring now to Figures 2 and 3, there is shown the details of the hand guard 32 and riving knife 34. The hand guard 32 is an arcuate channel member
20 48 having a radius of curvature mating with the contour of the upper protective shield 24. Preferably, a lift tab 50 is provided at the upper end of the channel member 48 to facilitate the raising and lowering of the hand guard 32 relative to a workpiece. An upper end 52 of the pawl arm 40 is fixedly attached to the channel member 48 and the lower end has an extension 54 through which is provided a pawl
25 mounting bore 56. Anti-kickback pawls 36 and 38 are pivotably attached to the pawl arm by means of a pivot pin or bolt 57 received in pawl mounting bore 56. The anti-kickback pawls 36 and 38 are mounted at the end of the pawl arm 40 at a location such that when the base 58 of the channel member 48 is slightly above the surface of the workpiece to be cut, the anti-kickback pawls 36 and 38 are properly
30 positioned to engage the workpiece and prevent it from being kicked back into the saw blade.

Figure 4 shows, in greater detail, the mounting of the guard system on the upper protective shield 24 of a radial arm saw. As shown on the cross-sectional view of Figure 3, the sides 60 and 62 of the channel member 48 straddle the sides of the upper protective shield 24 shown in the phantom.

5

The positioning of the guard system is very easy to accomplish. The operator has only to loosen knob 28 and lower the hand guard 32 until the base 58 touches the surface of the workpiece. The operator then raises the hand guard 32 a small amount, approximately 1/8 inch (3.0mm) or less which permits the workpiece to slide freely under the base 58 of the hand guard 32. This positioning of the hand guard 32 relative to the workpiece automatically positions the anti-kickback pawls on the surface of the workpiece to allow the workpiece to move in one direction, the direction of feed, while prohibiting movement in the opposite direction. After the hand guard is positioned, the riving knife is positioned to fit into the saw kerf then the two are locked in place by tightening the lock knob 28. The riving knife helps to reduce pinching of the saw blade due to warpage of the wood during cutting.

As described above, the hand guard 32 helps to prevent the engagement of the operator's hand with the spinning saw blade. Further, the anti-kickback pawls are automatically set with the setting of the hand guard. Finally, as shown in Figure 5, when the hand guard is set, the anti-kickback pawls prohibit the insertion of the workpiece into the saw in the wrong direction and to prevent kickback.

One of the advantages of the guard system is that it may be retrofit on to many existing radial arms saws with minimal or no modification, because many of the existing radial arm saws already have a lock knob 28 for holding a riving knife. Therefore, the quick set guard system may be incorporated in new radial arm saws or may be distributed as kits to update and improve the safety of existing radial arm saws.

While embodiments of the invention have been illustrated and described, it is not intended that these embodiments illustrate and describe all

possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention.

WHAT IS CLAIMED IS:

- 1 1. A quick set guard system for a radial arm saw having at least
2 a stationary upper protective shield covering the top half of a motor-driven saw
3 blade, the system comprising:
4 a hand guard having an upper end, a base end and an arcuate profile
5 mating with the contour of the upper protective shield;
6 a pawl arm having one end attached to the upper end of the hand
7 guard and a lower end adjacent to the base;
8 a pair of anti-kickback pawls attached to the lower end of the pawl
9 arm, at a location selected to properly engage the surface of a workpiece when the
10 base of the hand guard is spaced a selected distance from a top surface of a
11 workpiece; and
12 means for securing the hand guard to the upper protective shield
13 adjacent the outfeed end of the saw blade.
- 14 2. The guard system of claim 1 wherein the hand guard has a "U"
15 shaped cross-section having parallel side portions straddling the sides of the upper
16 protective shield.
- 17 3. The guard system of claim 1 wherein said means for securing
18 comprises a longitudinal slot provided in the hand guard and a locking knob received
19 through the longitudinal slot to lock the hand guard to the stationary protective shield
20 adjacent the outfeed end of the saw blade, the longitudinal slot permitting the hand
21 guard to be slidingly displaced relative to the protective shield and to be locked to
22 the upper protective shield with the base of the hand guard spaced the selected
23 distance above the top surface of the workpiece independent of the thickness for the
24 workpiece.
- 25 4. The guard system of claim 1 wherein the selected distance
26 above the top surface of the workpiece is approximately 3 millimeters or less.

27 5. The guard system of claim 3 further including a riving knife
28 attachable to the hand guard.

29 6. The guard system of claim 5 wherein the riving knife has a
30 mounting bracket having an elongated slot through which the locking knob is
31 received permitting the independent positioning of the riving knife relative to the
32 workpiece.

33 7. A quick set guard system for a radial arm saw having at least
34 a stationary upper protective shield covering the top half of a motor driven saw blade
35 and a locking knob attachable to the protective shield, the guard system comprising:
36 a hand guard having an arcuate contour mating with the external
37 profile of the protective shield, an upper end, a base, and a longitudinal slot through
38 which the locking knob is receivable to lock the hand guard to the protective shield,
39 a pawl arm having one end attached to the upper end of the hand
40 guard and a lower end adjacent to the base; and
41 a pair of anti-kickback pawls attached to the pawl arm, at a location
42 selected to properly engage the surface of a workpiece when the base of the hand
43 guard is spaced a selected distance from the top surface of a workpiece.

44 8. The guard system of claim 7 wherein the hand guard has a "U"
45 shaped cross-section having parallel sides straddling the sides of the upper protective
46 shield.

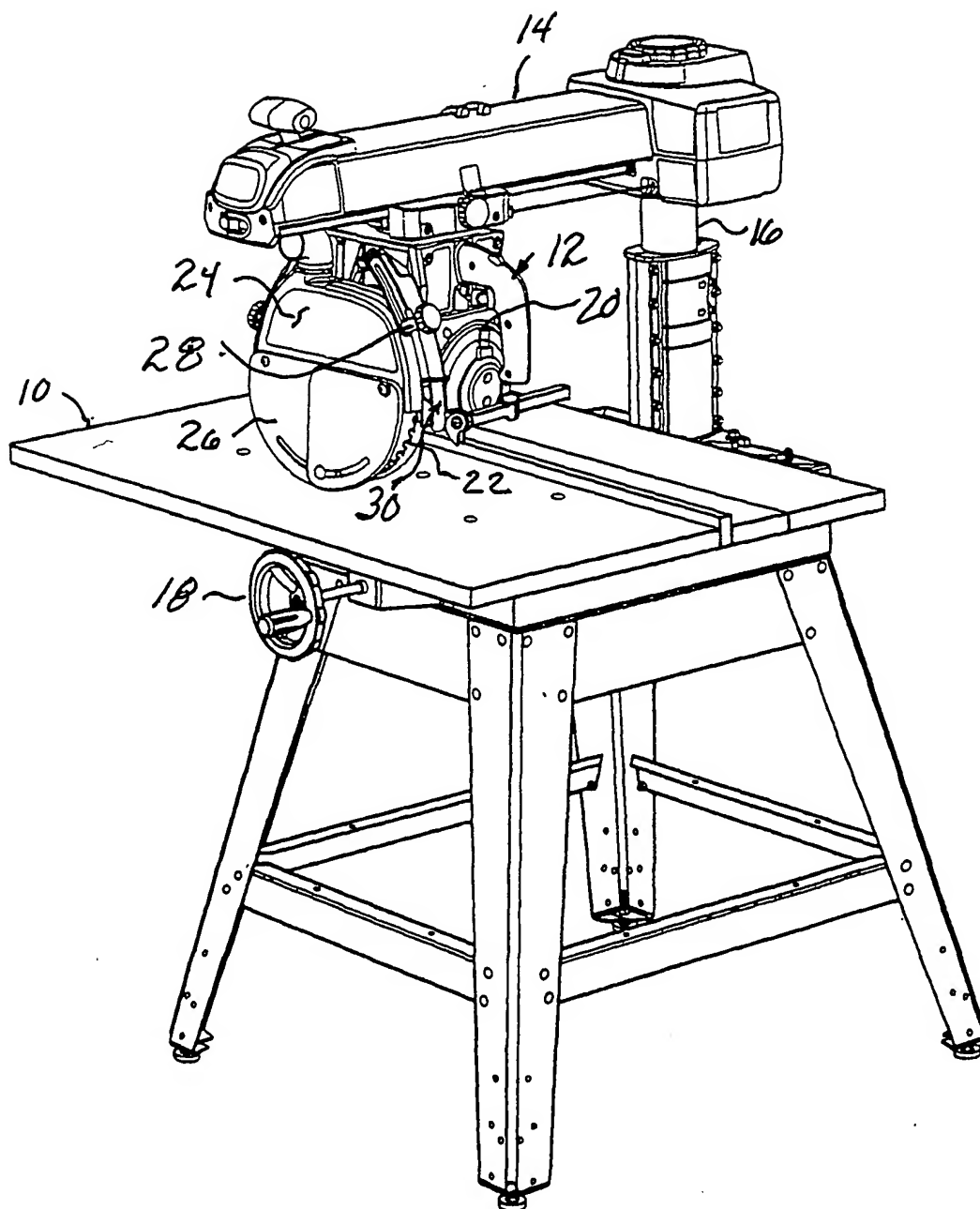
47 9. The guard system of claim 7 wherein the selected distance of
48 the base above the top of the workpiece is three millimeters or less.

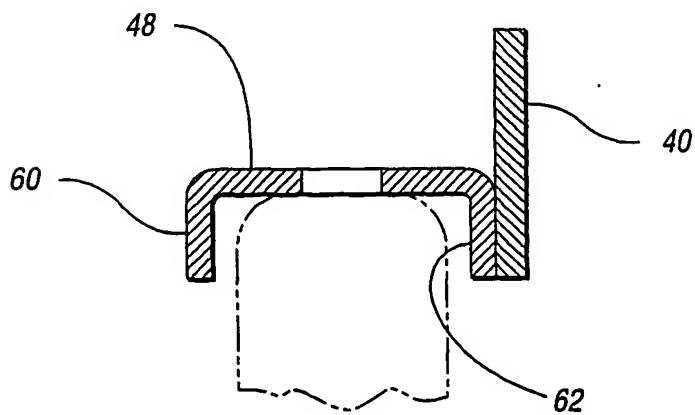
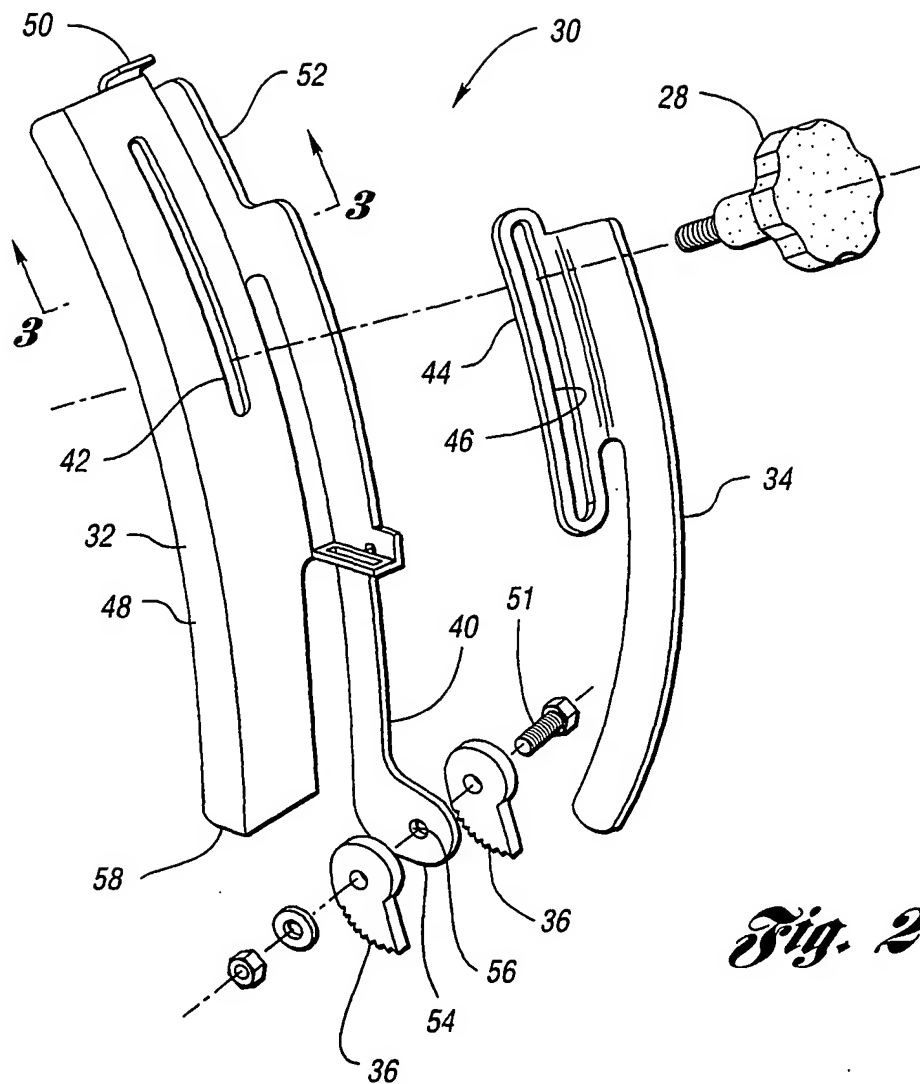
49 10. The guard system of claim 7 further including a riving knife
50 attachable to the hand guard by the locking knob.

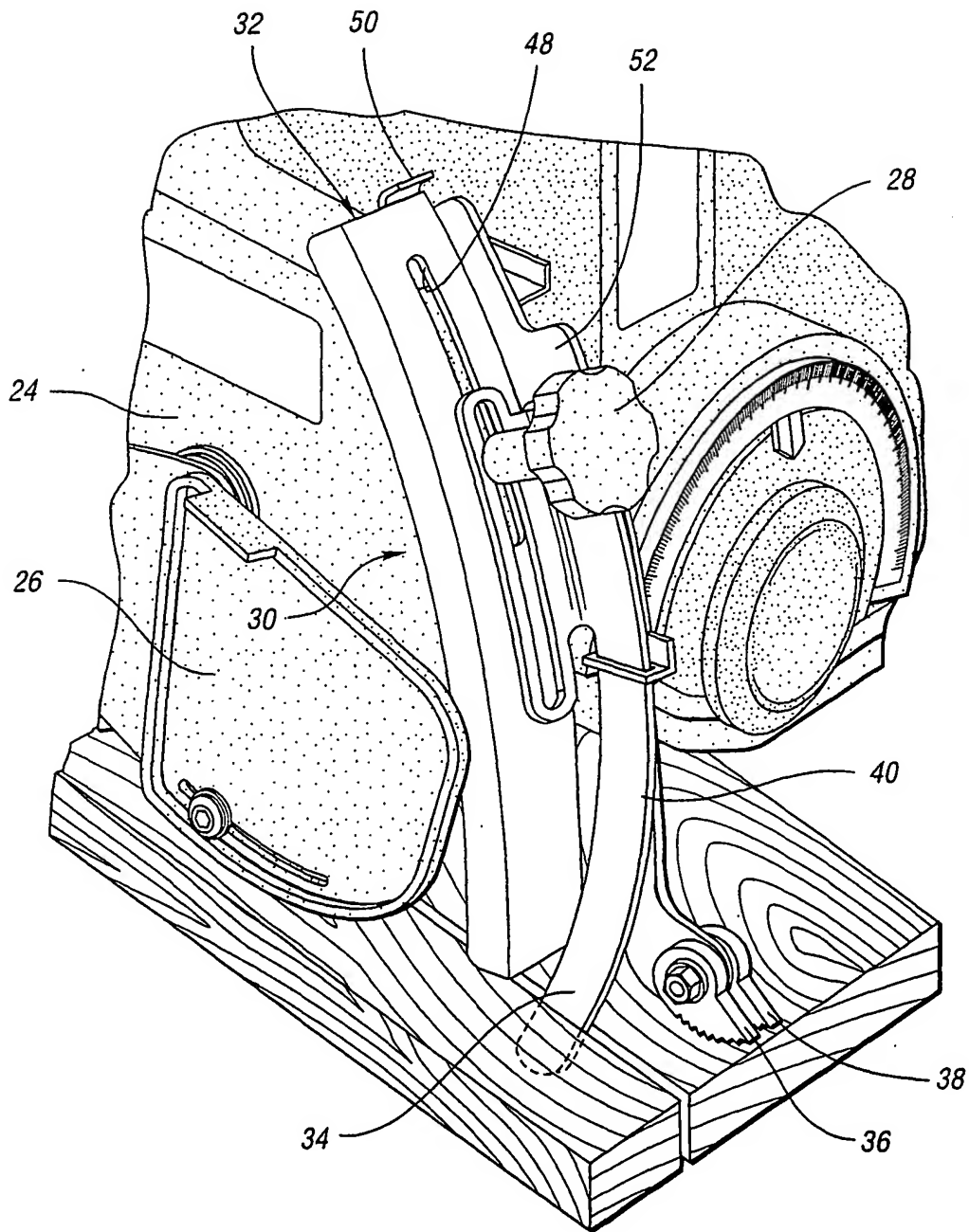
51 11. The guard system of claim 10 wherein the riving knife has a
52 mounting bracket having an elongated slot through which the locking knob is
53 received to lock the riving knife to the hand guard.

54 12. The guard system of claim 7 wherein the pawl arm is integral
55 with the hand guard.

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*Fig. 1*



*Fig. 4*

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/41109

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : B27B 5/20; B27G 19/02

US CL : 83/471.3, 478, 486.1, Dig. 1

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 83/471.3, 478, 486.1, Dig. 1, 397, 544

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	US 5,287,780 A (METZGER, JR. et al) 22 February 1994 (22.02.1994), figure 2.	1-12
Y	US 5,287,779 A (METZGER, JR) 22 February 1994 (22.02.1994), figures 6-7.	1-12
A	US 2,926,709 A (KALEY) 01 March 1960 (01.03.1960), figure 1.	1-12
A	US 3,580,307 A (MINETOS) 25 May 1971 (25.05.1971), figures 1-3.	1-12
A	US 4,150,598 A (BERENDS et al) 24 April 1979 (24.04.1979), figure 1.	1-12
A	US 4,532,841 A (STACKHOUSE, JR) 06 August 1985 (06.08.1985), figure 6.	1-12
A	US 4,576,073 A (STINSON) 18 March 1986 (18.03.1986), figure 2.	1-12
A	US 4,892,022 A (COTTON et al) 09 January 1990 (09.01.1990), figure 2.	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/41109

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 5,918,521 A (SARTORI et al) 06 July 1999 (06.07.1999), figures 3-4.	1-12
A	US 5,918,522 A (BENEDICT et al) 06 July 1999 (06.07.1999), figure 5.	1-12
A	US 5,950,514 A (BENEDICT et al) 14 September 1999 (14.09.1999), figure 1.	1-12